

Patent claims

1. Piezoceramic composition with the general molecular formula $Pb_{1-a}RE_bZr_xTi_yTR_zO_3$, in which
 - RE is at least one rare earth metal selected from the group europium, gadolinium, lanthanum, neodymium, praseodymium, promethium and/or samarium with a rare earth metal proportion b,
 - TR is at least one transition metal selected from the group chromium, iron and/or manganese with a transition metal valency W_{TR} and a transition metal proportion z and
 - The following relationship applies: $z > b/(4 - W_{TR})$.
2. Piezoceramic composition in which the rare earth metal proportion is selected from a range of 0.2 mol% to 3 mol%.
3. Piezoceramic composition in accordance with Claim 1 or 2, in which a sum of the rare earth metal proportion and of the transition metal proportion is less than 6 mol%.
4. Piezoceramic composition in accordance with one of the Claims 1 to 3, in which the RE is a single rare earth metal and TR is selected from at most two transition metals or TR is a single transition metal and RE is selected from at most two rare earth metals.
5. Piezoceramic composition in accordance with one of the Claims 1 to 4, with a value for a mechanical quality factor Q_m which is selected from a range 50 up to and including 1800.
6. Piezoceramic composition in accordance with one of the Claims 1 to 5, with a Curie-temperature T_c lying above 280°C.

7. Method for producing a piezoceramic composition in accordance with one of the Claims 1 to 6, in which a maximum particle growth of the piezoceramic composition is determined at a specific sinter temperature.
- 5 8. Method in accordance with Claim 7, where the following steps are performed:
- a) Definition of the rare earth metal proportion b ,
 - b) Definition of the transition metal proportion z ,
 - c) Sintering of the piezoceramic composition at the sinter
10 temperature,
 - d) Determining a particle size of the sintered piezoceramic composition and
 - e) Repeating steps b) to d), with the transition metal proportion z being varied.
- 15 9. Method in accordance with Claim 7 or 8, with the transition metal iron with an iron proportion z_{Fe} and the transition metal manganese with a manganese proportion z_{Mn} being used, so that the relationship to $z_{Fe} + 2 \cdot z_{Mn} > b$ is produced and with the variation of the manganese proportion z_{Mn} , essentially the
20 dissipation factor $\tan \delta$ of the composition and with the variation of the iron proportion z_{Fe} , essentially the maximum value particle growth of the composition are set.
10. Piezoceramic body with a piezoceramic composition in accordance with one of the Claims 1 to 6.
- 25 11. Piezoceramic body in accordance with Claim 10, featuring a metallization selected from at least one of the group silver, copper and/or palladium.
12. Piezoceramic body in accordance with Claim 11, in which a proportion of palladium is selected ranging from 0% up to an
30 including 30%.

13. Piezoceramic body in accordance with Claim 12, in which the proportion of palladium amounts to a maximum of 5%.
14. Piezoceramic body in accordance with one of the Claims 10 to 13, featuring a monolithic multilayer construction in which piezoceramic layers with the piezoceramic composition and electrode layers with the metallization are arranged alternating above one another.
15. Piezoceramic body in accordance with one of the Claims 10 to 14, which is a component selected from the group actuator, bending converter, motor and/or transformer.
16. Method for producing a piezoceramic body in accordance with one of the Claims 10 to 15, with the steps:
 - f) Provision of a green body with a piezoceramic composition in accordance with one of the Claims 1 to 6 and
 - g) Sintering of the green body to the piezoceramic body.
17. Method in accordance with Claim 16, where a green body is provided with a metallization which is selected from the group silver, copper and/or palladium.
18. Method in accordance with Claim 16 or 17, where the sintering is undertaken in an oxidizing or reducing sinter atmosphere.
19. Method in accordance with one of the Claims 16 to 18, with a sinter temperature ranging from 900°C to 1100°C inclusive being selected for sintering.

20. Method in accordance with one of the Claims 16 to 19, with a green body with a plurality of particle growth seeds being used with the piezoceramic composition.